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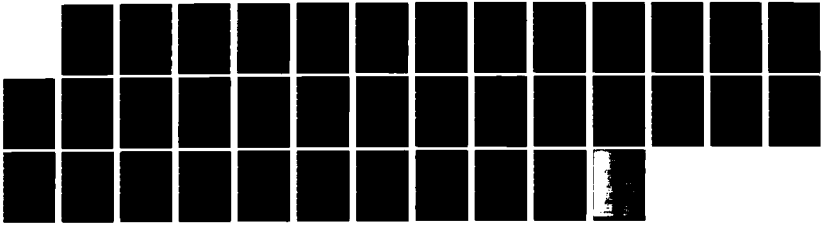

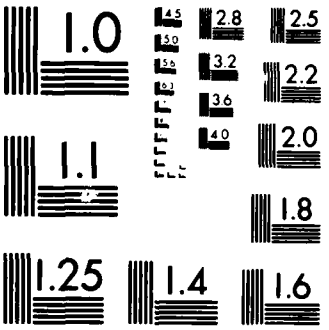

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This report reviews the current acquisition management environment at ASD. Consideration is given to such factors as the significance of the environment influencing factors and standards which are being set as a result of this environment. The report documents those opportunities which now exist to enhance planning and scheduling within this environment and some current developments which further describe it. Based on these observations some specific recommendations and concerns that may require further study are identified.

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This report expands upon ASD Reserve Project 78-25, "Planning and Scheduling at ASD - A Review and Preliminary Assessment."

ASD RESERVE PROJECT REPORT 80-015 HOU

PLANNING AND SCHEDULING ENHANCEMENT

IN THE ACQUISITION PROCESS

AT THE AERONAUTICAL SYSTEMS DIVISION

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November 1982

Sponsored by:

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AFBRMC/RDCB
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With apologies to many other persons, who in the past several years have given information and advice, I wish to give special recognition to the staff of ASD/XRX under Col Robert Weber, to Zada Branscomb of ASD/ACBM, who is the ASD focal point for planning and scheduling support of the program offices, and to 1 Lt Roseann Miller, ASD/ACP, who is making remarkable progress with the implementation of the Automated Management System. All have taken time to provide important background information for this report. The support of AFSC Contract Management Division staff members during the initial stages of this study is also appreciated. This effort had the full support of ASD/XOR and AFBRMC in the special trips required to collect and prepare information.

CONTENTS AND SUBJECT LIST

CONTENTS AND SUBJECT LIST (CONT'D)

INTRODUCTION

The enhancement of planning and scheduling at the Aeronautical Systems Division (ASD) will increase the strength of this critical aspect of Program Control. Methods of tracking and controlling costs are well established within the Air Force, and many levels of organizations are involved in this effort. Scheduling is a different matter. Regulations and other documents explain the importance of planning and scheduling, but there is a lack of consistency in practice. This report will identify ways in which planning and scheduling at ASD can be improved. It will build upon ASD Reserve Project 78-25, "Planning and Scheduling at ASD - A Review and Preliminary Assessment". Project 78-25 attempted to answer the following questions:

1. Planning and Scheduling (P&S) definition: What is the scope of planning and scheduling techniques at ASD?

2. Planning and Scheduling environment at ASD: What are the proper roles for planning and scheduling in an ASD program as compared to a typical industry program?

3. Current ASD P&S areas: How do the roles of the Independent schedule assessment, The Vanguard system, and an Automated Management System (AMS) relate to the P&S function at ASD?

4. ASD P&S related organizations: Which organizations are currently doing tasks related to planning and scheduling, and what are some alternatives for improved integration and coordination of the P&S functions?

SUMMARY

This report reviews the current acquisition management environment at ASD. Consideration will be given to such factors as the significance of the environment influencing factors and standards which are being set as a result of this environment. This report will also document those opportunities which now exist to enhance planning and scheduling within this environment and some current developments which further describe it. Based on these observations some specific recommendations and concerns that may require further study will be documented.

OBJECTIVE

The objectives of this report are:

1. Show why planning and scheduling enhancement is particularly significant in todays environment.

2. Identify some ways in which planning and scheduling can be readily accomplished. These objectives are particularly important in a time when the government is trying to reduce overall spending while at the same time increase its defense capability. This situation places the Air Force, and specifically ASD, in a position of doing more with less.

DEFINITION

Planning and scheduling deals with time factors which ultimately and directly affect cost factors. The P&S function includes the following tasks:

1. The definition of all the work or activities to be accomplished by all program personnel funded within the program budget.

2. The ordering of the sequence in which all these activities should take place.

3. Determining the material and personnel resources which will be required to accomplish these activities.

4. Utilizing identified resources to determine the time required to perform these particular activities.

5. Summing up those durations of time identified for those activities to determine chronologically when those activities must be accomplished.

6. Once the plans and schedules are established, they must be tracked and controlled Forecasts must be made on the ability to maintain or recover schedule commitments.

7. Finally, being prepared to rework these plans. As work is redefined or corrected, the schedule must be revised, resources redistributed and the sequence of work often changed.

THE CURRENT ASD ACQUISITION MANAGEMENT ENVIRONMENT

The Air Force has been assigned a responsibility for acquiring a major portion of the current increase in national defense capability and ASD has assigned the major portion of that responsibility. Therefore, ASD's performance will be closely evaluated as to overall cost and schedule performance. The standards for this performance have been set by such documents as Department of Defense Directive 5000.1, dated 29 March 1982 "Major Systems Acquisition", and AFSC Inspector General's stated concerns for planning and scheduling performance.

DODD 5000.1 states that defense systems procurement should be accomplished in a cost-effective manner. This report also establishes that the acquisition time shall be reduced if possible by the implementation of *flexible program phasing and structuring approaches* with an eye on cost-effectiveness.

In his reviews of the product divisions, the AFSC Inspector General has indicated a concern that planning and scheduling should not be neglected in at least five areas: 1) The program master schedule should provide for integration of all major program activities, all major decision points, and should include all officially directed milestones. 2) That detail scheduling backup should exist for all major program activities. 3) That efforts should be made to minimize and analyze schedule uncertainties and perform program risk analysis. 4) That schedule changes (contractions and extensions) should be properly analyzed to gauge cost and technical impacts. 5) Contractor developed schedules should be given an independent analysis for credibility and validity. There is a need for program managers to review their planning and scheduling function and avoid the possibility of corrective actions being recommended by outside agencies.

There is increasing interest in planning and "pre-planning" in the area of defense expenditures. This includes the concept of multi-year funding, and the resultant planning criteria and control this would require. Also included is the possible need for module level change management; a concept which seeks to restrict the potential for change to those areas most subject to them. Also the overlapping of acquisition phases requires additional and careful planning, a heavier staff, and utilization of program control functions such as planning and scheduling. The recruitment of planning and scheduling personnel, training in ASD applications, along with the careful and accelerated use of planning and scheduling of computer technology is required to support this increasing planning emphasis.

In order to meet objectives of reducing time and cost in the acquisition process there are certain management tasks to be accomplished. These tasks include setting priorities, pre-planning for critical activities, avoiding program manpower competition, critical path identification, and analysis. A description of these tasks is as follows:

1. Setting Priorities. The concept of a priority deals with the assignment of limited resources to the most critical needs. This takes into account the lead time required, and end date required. the Air Force System Command's Vanguard has been aimed at this question and is important to our later discussion.

2. Pre-Planning for Critical Activities. The planning and scheduling logic diagram or network highlights the activities upon which a program depends. These activities are often the junction of many prior activities, or exist in a critical time period. Costly delays will occur if these activities are not properly identified.

3. Avoiding Program Manpower Competition. Only through the comparison of program activity logic networks can the times of competing need for scarce manpower skills be clearly identified, and costly extra manpower charges be avoided.

4. Critical Path Identification and Analysis. Unless the critical path is identified, it will not be possible to reduce the time of that path and related cost. Every program has many critical paths, only clear identification and analysis of quality networks will allow any potential cost savings.

5. Effective Management and Control. The disciplines required to establish a good planning and scheduling system, will provide the tools necessary for effective management and careful review of cost-causing activities as early as possible.

EXISTING OPPORTUNITIES FOR ENHANCING ASD PLANNING AND SCHEDULING

In order to provide the opportunity for the enhancement of planning and schedulng (P&S) at ASD certain essential elements must be in place. It is the finding of this report that ASD now has these elements in place or steps are being taken to provide for their implementation. These essential elements must provide the capacity for identifying and processing the large amount of data which an ASD-wide planning and schedulng system would require. P&S system elements must assure that the information can be tested and validated, and they must assure that the communication channels are available for the timely transmission of data.

These P&S system elements must also provide an overall approach and structure for evaluating, assessing, and prioritizing all of the ASD programs and their interrelationships. In summary, information handling capacity, information verification capacity, information communication capacity, and the capacity for overall visibility is necessary for an effective ASD planning and scheduling system.

There are four areas of P&S activity ongoing at ASD which have been implemented and which with some improvements could provide a significant enhancement of the ASD planning and scheduling function. These four areas are: 1) The Automated Management Systems (AMS) now being implemented by the Directorate of Program Control for the Comptroller. 2) The Independent Schedule Assessment (ISA) also assigned to the Comptroller. 3) The Contract Management Division ties through the Air Force Plant Representatives Offices, at the various contractors, to collect data for and receive direction from ASD Program Managers. 4) The Vanguard program, directed from Air Force Systems Command, and under the ASD direction of the Deputy for Development Planning. The following sections explain how these activities can satisfy the four essentials for good planning and scheduling:

HANDLING INFORMATION THROUGH AUTOMATED MANAGEMENT SYSTEMS

An Automated Management System (AMS) is currently under development and is the implementation of an ASD-wide systematic approach to improving planning, reduction of duplicate automation efforts, and increase of standardization where it is reasonable and feasible. Included in this will be a planning and scheduling system. At this time it appears that the selected system will be a full capable Critical Path Method system. It will provide a complete line of analysis, sorting and reporting options.

There is also an existing system called Acquisition Management Information System (AMIS), which is primarily used for the collection of actual and historical data including schedule information. This system should provide some helpful information for Independent Schedule Assessments. It is not now planned to include any planning capabiliy in AMIS such as in the AMS.

The AMS capability will be aimed at the Vanguard overall planning system by early 1983 in order to provide source information. The AMS organization is now seeking to service program organizations. Providin Vanguard with adequate information may not be possible until the SPOs are fully included in the data base.

Vanguard is currently not receiving any direct inputs from AMS. A direct support from AMS will eliminate some of the redundant reporting, and assist in assuring the commonality of information in all reporting and analysis systems.

VERIFYING INFORMATION THROUGH THE INDEPENDENT SCHEDULE ASSESSMENT

The Independent Schedule Assessment (ISA) was issued as an AFSC Regulation in January 1979. It was intended to provide an assessment, by a team of "experts" from outside the program office, of the realism of the projected program schedules. ISAs are normally conducted before a major Air Force Systems Acquisiton Review Council (AFSARC)/Defense Systems Acquisition Review Council (DSARC) milestones. These Acquisition Review Council milestones occur at the point of decision: 1) Leading to the initiation of a program, 2) The start of full scale engineering development, and 3) Production and deployment decision points.

The ISA is essentially a three-step process of: 1) Data collection, 2) Analysis, and 3) Evaluation and documentation. The assessment should include the original schedule from the SPO, and assessment of that schedule, the assumptions used in the analysis, the methodology used, and then the final conclusions. Assessment team members will come from the Comptroller's office, Engineering, and the Contracting/Manufacturing organization. Data is gathered from the program office, the contractor, and historical records of similar programs.

The assessment will include the design, testing, production, and installation and deployment phases of the program. It's conclusions will usually include a critical path analysis, a schedule risk analysis, and the identification of optimistic, pessimistic, and most-likely dates.

INFORMATION COMMUNICATION THROUGH AIR FORCE PLANT REPRESENTATIVE OFFICE AND THE MEMORANDUM OF AGREEMENT

The Air Force Plant Representative Office (AFPRO) is under the command of the Contract Management Division. This division services all the product divisions of AFSC including ASD. The AFPRO at each contractor facility must support all the divisions having a contract with that contractor at that facility. In order to detail this support beyond the obvious contract language, a Memorandum of Agreement (MOA) is drawn up between the AFPRO and SPO.

AFPRO is the on-site representative of the program manager for the Air Force. It's personnel are industrial engineers and specialists who have detailed knowledge of the contractor's operation. Typical AFPRO functions include an analysis of the contractor's capability, the support of program reviews, the conduct of special surveys, and assistance in problem resolution. The results of the B-1 program's interest in and use of the MOA will be reviewed later in this report.

A current concern for planning and scheduling in the area of contractor relations is the question of fixed versus non-fixed price type contracts. Contracts will vary from type to type, but a typical one for the larger non-fixed price contract utilizes the C/SCSC, Cost/Schedule Control System

Criteria. This criteria directs the contractor to develop a detailed work break-down structure for all of his work, identify all organizations for each work package, establish integrated project controls, identify inter-dependencies, deliverable products, and control major program milestones. In the typical fixed price contract this kind of requirement is not possible.

ADEQUATE VISIBILITY THROUGH VANGUARD

One of the brightest opportunities for initiating complete and professional planning and scheduling at ASD has come with the creation of AFSC's Vanguard planning and monitoring system. Vanguard goes from the concept formulation study through the initial operational capability of a system. Its levels include mission and sub-mission, major force, and functional areas. Vanguard contains interrelationships between systems and areas, phasing of support system and functions, funding information, major decision points, and covers the full scope of each system included. This management system has already established its value and is accepted by higher command. It generates needed program management data, encourages standardization of tracking and reporting, provides wide scope visibility and facilitates the utilization of planning concepts.

The Automated Management System is a future source of support for Vanguard.

RELATIONSHIPS

Figure 1 is a simple diagram of the relationship by which the four elements should complement each other and produce an effective ASD-wide planning and scheduling system. The top of the diagram shows the AFPRO MOA support which provides the essential Program Office/Contractor facility and information communication link. This information is effectively handled by the AMS, providing quick and timely data, as well as supporting analysis. As each program moves forward, Vanguard will provide not only overall program visibility but by maximizing specific program involvement it would be an even more effective tool if used more than once a year. The critical decision points can be supported by the ISA which gives another objective look at the proposed schedules.

RELATIONSHIPS OF

FUNDAMENTAL PLANNING AND SCHEDULING ELEMENTS

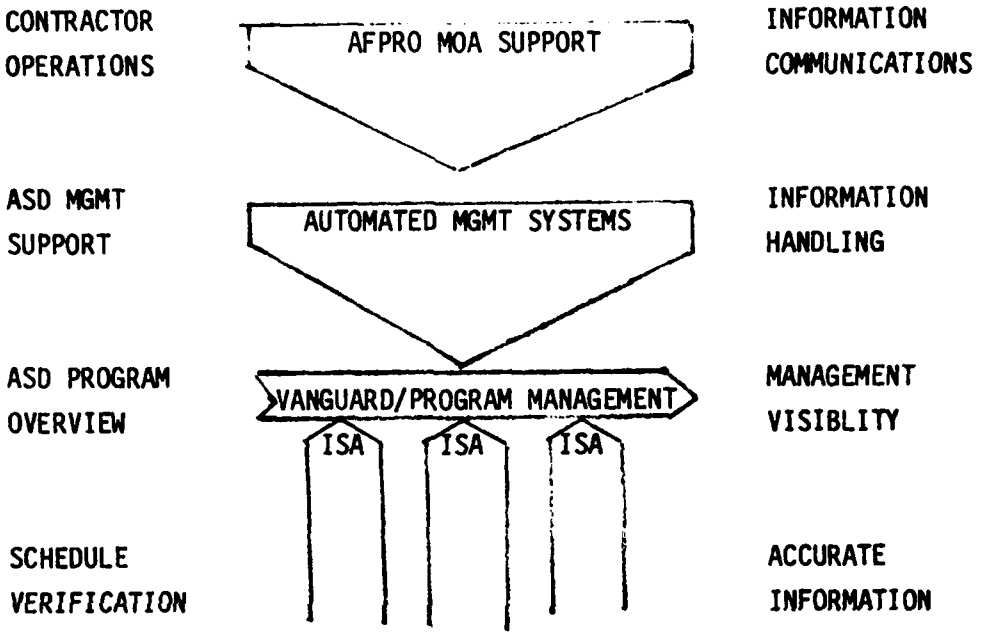

FIGURE 1

In the following section a picture of how these relationships are beginning to work will be described. It will be an update of the first report put out in 1980, and will further support the recommendations which will follow.

CURRENT DEVELOPMENTS AT ASD RELATING TO P&S ENHANCEMENT

1. Organization and Personnel Developments

There has been some clarification in organization responsibilities since the last report (78-25). In the Comptroller's organization (ASD/AC) the activities of special interest are found in three related organizations. ACP, Directorate of Program Control has responsibility for placement and

coordination of all AC matrixed personnel. The personnel classification most applicable to the planning and scheduling function is that of the Program Analyst. Some new individuals have recently been added to this field, and will be assigned to various locations. ACC, Directorate of Cost Analysis is responsible for integrating the Independent Schedule Analysis and the Independent Cost Analysis. However, the ISA utilizes Program Analyst personnel in the ACB Directorate in developing that assessment. ACB, Director of Programs and Budget, contains the Program Analyst most concerned with coordinating efforts relating to the overall planning and scheduling type of function in the SPOs. This currently includes the preparation of a planning and scheduling guide for programs at ASD.

2. DOD Directive 5000.1, Dated 29 March 1982, Major Systems Acquisitions

The subject Directive will set the tone for major system program control activity, including as it is related to the planning and scheduling function. This directive states that the acquisition responsibility shall be placed at the lowest level of the organization where a comprehensive view of the program exists. It further states that operational effectiveness, operational suitability, and operational readiness must be considered. These concerns are fully compatible with the achievement of schedule and performance objectives. The Directive further requires that the responsible organizations have the following:

1) Effective long-range plans

2) Consideration of evolutionary alternatives rather than developments that push the state of the art in technology.

3) Realistic budgetary estimates

4) Economical rates of production

5) Acquisition strategies established at the outset of any development acquisition program.

The normal phases of the acquisition process are concept exploration, demonstration and validaton, full-scale development, and production and deployment. However, the directive states that these phases are to be tailored to fit each program to minimize acquisition time and cost, consistent with the need and degree of technical risk involved. This is a stronger emphasis on expediting program completion than the more gradual approach of previous Directives.

The decision points for these systems by the Secretary of Defense are:

1) Mission Need Determination. After the budget review of Program Objectives Memorandum (POM), a Program Decision Memorandum (PDM) will provide appropriate program guidance. This will include official sanction to start a new program.

2) Milestone I. This decision is based upon a System Concept Paper (SCP) which allows evaluation of concepts, costs, schedule, readiness objectives, and affordability.

The resulting decision will establish thresholds and objectives to be met and reviewed at the next milestone, along with a dollar threshold that can be exceeded.

3) Milestone II. Proceed with full-scale development. The next milestone (III), the production decision, will be made at the DOD component level. There is expected to be some flexibility in these decision points as best definition of performance, cost, schedule, producibility, industrial base responsiveness, supportability, and testing to reduce risk is considered.

The Directive further states that "minimizing the time it takes to acquire material and facilities to satisfy military needs shall be a primary goal in the development of an acquisition strategy. Particular emphasis shall be placed on minimizing the time from a commitment to acquire an operationally suitable, supportable, and effective system to deployment with the operating force in sufficient quantities for full operational capability.

Commensurate with risk, such approaches as developing separate alternatives in high-risk areas, early funding to design-in reliability and support characteristics, lead time reductions, through concurrency, prototyping of critical components, combining phases, pre-planned product improvement, additional test articles, or omitting phases should be encouraged."

Such encouraged flexibility will also require greater discipline within the program control systems, and this is part of the job of a skilled and fully capable planning and scheduling function.

3. B-1 System Acquisition Program

With the Reagan Administration's Commitment to enhance the United States defense posture while at the same time striving to achieve a balanced federal budget, added pressures have been placed on the economical and timely procurement of extremely complex weapon system. Such a system is the B-1 bomber. This system was given authority to proceed (ATP) in January of 1982; however, this ATP was promised on the basis of a cost ceiling commitment of $20.5B (Jan 81 dollars) and the scheduled Rollout for first flight by October 1984 with the first flight to be accomplished in December 1984.

Such a commitment has necessitated the implementation of some very strigent and effective management techniques. Major General William E. Thurman as deputy for the B-1 at ASD has instituted a level of discipline into the management of the B-1 that has seldom if even been observed in any DOD program. Evidence of this austere but comprehensive management approach is the following.

1) The B-1 Systems Project Office (SPO) of 280 people is the smallest SPO at the Aeronautical Systems Division (ASD) in 15 years.

2) A significant responsibility for project support has been delegated by the B-1 SPO to other organizations such as the AFPRO. Memos of agreement have been established to document their work assignments. Specific MOAs from the AFPROs have increased the amount of specific task responsibilities which these organizations have normally accomplished. Their participation in data collection and analysis is proving to be effecive and beneficial. The planning and scheduling reports have proven to be traceable to the lowest level of work.

3) Detailed schedule documentation has been required from each of the B-1 associate contractors with the Air Force serving as the systems integrator. ICDs (Interface Controlled Documents) and associate contractor agreements have been established between all associate contractors.

The C/SCSC procedure has been implemented and the P&S systems for each of the associate contractors provides the required information. Each of the associate contractor systems differs significantly in type, but each has been able to provide satisfactory support for milestone progress and traceability.

The mangement style of the B-1 SPO Commander is one of close personal follow-thru on all significant activities on a regular basis. The future reporting techniques, including the mangement visiblity provided by the briefing charts and the automated display data, will increase the capacity to deal with growing problems before they get too large. Effort is also being expended to prepare for downstream interfacing as this heavily phased progam progresses.

A second overriding principle being implemented by the B-1 program mangement personnel has to do with the mangement response mode. There is a tendency in major weapon systems development programs to operate in a strictly reactive mode, whereby the total focus is on problem solutions rather than the preventive practice of avoiding problems. The B-1 has made a conscious move to avoid this tendency and has established a requirement in every program area that appropriate personnel take the initiative to get in front of potential problems rather than simply become reactive to them.

The significance of this B-1 program strategy as it relates to this study concerning the enhancement of planning and scheduling in the acquisition process at ASD, is that many of those schedule and planning improvements recommended by this report are being implemented within the B-1 program. Some of these scheduling and planning improvements are being implemented for the first time. However, it was observed in the context of this study that several actions may be appropriate within the B-1 program in order to enhance their schedule and planning performance. Their actions were discussed with the B-1 program control office and are as follows:

a) Additional detail and follow-up would be helpful as to the automation phasing of the program control office in learning to use automated displays and maximize effective and significant communication, and minimize unused paper work.

b) The scheduling integration effort will be important to watch along with the integration of approved changes, and the integration of design and test data from ongoing work with other parallel work.

c) The specific role of P&S personnel from the contractors and their SPO counterpart should also be detailed. It is important to have a scheduler talking to and a scheduler from time to time, if not a regular basis. Greater understanding of what types of interface and impacts are occurring can be realized. Also the types of schedules used by sub-contractors and vendors should be reviewed.

d) Some Independent Schedule Assessments were made at the early part of the program by the Comptrollers organization to assist in verifying the schedule. The effort was found to be helpful for testing contractor developed information.

e) The only method currently of integrating the schedule assessments from the associate contractors is through the various bar chart reports that show the major program milestones. Other future schedule evaluation techniques may be required. It was recommended to B-1 program control that a CPM type system be used, perhaps considering the Vanguard charting concepts. This would simplify coordination of B-1 reports and the regular Vanguard reports.

4. F-15 Business Management System Refinement

ASD Reserve Project 81-171-DAY was accomplished for the purpose of providing the ASD Deputy Program Manager for Logistics (TAFL) with a method to update the logistics data in the F-15 Business Management System (BMS). One of the outputs of this project was an educational update of the current BMS. This process led to some improvements concerning the software package for BMS.

It was the finding of the ASD Reserve Project 81-171-DAY that the F-15 Business Management System has minimal data in the system for such critical functions as retrofit management. It was also the finding of this study that upgrading of the F-15 BMS has not been accomplished rendering it unusable.

These project findings substantiate a premise of this study, namely that a currently maintained business management system which includes accurate and current scheduling data is a necessary management tool. The contrast of the finding of ASD Reserve Project 81-171-DAY concerning the F-15 program and those findings concerning the B-1 program which resulted from discussions with the B-1 program control chief were significant. In the case of the B-1 program an automated scheduling status system was considered a vital requirement for sucessful B-1 program management. The significance of this automated scheduling system to the B-1 management personnel was evident by the commitment of a team of program control personnel to the design, maintenance, and operation of the B-1 automated scheduling system. This B-1 approach provides a significant contrast to the F-15 BMS status as revealed by ASD Reserve Project 81-171-DAY.

5. Development Planning for the Future

ASD Reserve Project 81-190-TUL was accomplished for the purpose of evaluating the planning function as it is being accomplished at ASD. This project was recognized as noteworthy and was identified as one of the outstanding ASD reserve projects of 1981.

It was the findings of this project that there is an absence of clear understanding or agreement of what development planning should be at ASD. It was also the finding of this study that the major empahsis of ASD has been placed on near term planning to the detriment of long-term planning. It was the conclusion of this study that immediate attention to "what if" exercises are continually being directed by AFSC, as well as ASD, with no specific organization functionally tasked to handle these types of actions.

ASD Reserve Project 81-190-TUL also provided for a review of the Guide for Vanguard Planning, AFSC Pamphlet 80-3 with regard to it's interrelationship with development planning. It was the conclusion of this review that Vanguard is being implemented within the ASD planning organizations and is serving a beneficial effort for near-term planning. However, it was the conclusion of this study that the Vanguard Planning documentation is weak in it's guidance for and emphasis on long-range development planning, primarily because it is tied to budgeting of well defined requirements.

The recommendatons resulting from this project concerning ASD Development Planning for the future were that a more adequate understanding of development planning at ASD should be established. In order to achieve this objective, this study recommended that two task groups be formed at ASD. One group would be devoted to responding to urgent needs while a second task team would be specifically devoted to long-range creative planning. In order to achieve the objective rcommended for either of these two groups, it is the position of ASD Reserve Project 82-190-TUL that an in-depth education process concerning the budgetary process of the Air Force, DOD and ultimately the congress will be required.

It is also the finding of the study concerning ASD Development Planning for the future that management must be educated on the need to support the creative long-term innovative planners in their assignment. It was stated that support from the lowest to the highest levels of management would have to be obtained to assure continued support and funding of such an activity.

In concert with ASD Reserve Project 81-190-TUL it is the observation of this report that a clear definition and assignment of responsibilities for ASD planning and scheduling must be accomplished. In addition, it is observed that effective scheduling at ASD can only be accomplished with active and visible management attention and support. It is also the premise of this study that an educational foundation of the current scheduling techniques and tools will be required for the achievement of the ASD mission objectives.

SPECIFIC RECOMMENDATIONS

1. An ASD Planning and Scheduling Coordination Office

Four major organizations at ASD are significantly involved in the fundamental elements of the planning and scheduling function. These four organizations (Program Organizations, Comptrollers' organizations, Contracting and Manufacturing Organizations, and Deputy for Development Planning) perform their functions according to regulation. However, the goal of effective planning and scheduling is lost because they have many functions of which this is but one. These organizations can be expected to give their attention to the area where the interest and coordination effort is most intensive. The need for a single office to assist in the implementation and problem resolution in the critical area of planning and scheduling should now be considered.

The Planning and Scheduling Coordination Office needs to be a Division level office independent from any of the organizations it would coordinate. It's functions should not duplicate any existing function in the other organizations but should assure that proper emphasis be given to these special concerns and assist in the resolution of problems. The staff size should be kept to a minimum, and increased planning and scheduling efforts should be manned by one of the existing organizations wherever possible.

Some of the specific duties of this office would be:

1) Preparation of an ASD Regulation referencing existing regulations and policies which apply to this function and detailing coordination and standards which need to be emphasized or implemented. Additional guidelines could be issued for recommendations and clarification.

2) Coordination with the working level organizations involved in the planning and scheduling function to assist them as required with related problems.

3) Review planning and scheduling products and reports to assure their quality and adherance to established standards.

4) Review AFPRO/SPO Memorandum of Agreements to assure the best support possible for the planning and scheduling functions and requirements of the program.

5) Represent the various organizations in their planning and scheduling concerns at the Division level and conversely assure recognition of ASD concerns throughout all organizations involved in this function.

2. Extend Vanguard Applications

Vanguard is a system designed to assist in the prioritization of programs and systems. At the specific program level it should take on a different emphasis. It would be aimed at assuring that the priorities and scheduled milestones which have already been set are, and still can be, achieved. The purpose of using the Vanguard technique for doing this is to allow a smooth transition from the internal SPO program control status and procedure to the broad AFSC total mission analysis effort required on an annual basis. These two objectives should be compatible as far as these techniques are concerned.

A review of Vanguard Planning (AFSP Pamphlet 80-3, dated 3 Jun 82) will illustrate the areas of compatibility.

a) How does a program element contribute to meeting Air Force military needs? The same can be said for systems and sub-systems at the program level.

b) What is the contribution of a program to other mission areas? Particular programs have different configurations of end items. The contribution of systems to each end item is also apparent in the Vanguard technique.

c) What will happen if we cancel or delay this program? The same question applies to the delay for any reason, of a system or sub-system.

d) How much will the program cost? The cost breakdown could also be used in system level analysis, if there is a possibility of cost changes.

e) What are the key decision points and when do they occur? This would be one of the best uses of the Vanguard techniques in internal program evaluation.

The increased evaluation assessment of individual program systems and sub-systems would be based on their contribution to the mission of a particular end item. The full production item would most likely use all of the applicable systems, but some of the earlier end-items will have more limited missions. Some of these missions will require some of the systems on a lesser priority basis. This will provide a basis for the assessment technique. A systems deficiency at a point will relate to the particular end-item it is scheduled to support.

The significance of AFSC Program Objectives Memorandums (POM) may not be much on an individual program level, unless some of the supporting systems are subject to an annual review as to its funding and schedule availability.

In the definition of tasks for analysis purposes, the disciplined definition requirements of Vanguard will assist in evaluation system support of early end-item missions.

The "Synthesis" phase of Vanguard is most applicable to SPO program control requirements. Here a logic network of interrelated system and milestone support requirements can be well illustrated. This "hooks and strings" concept will pull together the milestones of the various contractors, and allow an overall analysis to be seen. On a progam level this would take place on at least a monthly basis, instead of the annual basis required by the scope of the main Vanguard program.

The calender for most Vanguard charts are annual. To allow Program Managers to use this concept for contractor, associate contractor, and subcontractor control, quarterly or monthly detailing would probably be necessary. However, many of the data items included on these more detailed charts, should also be included on the annual charts which directly relate to the normal Vanguard report packages.

A review of AFSC Pamphlet 80-3, dated 3 Jun 82, "Guide for Vanguard Planning", with particular attention paid to the section on Baseline Plan and Assessments will explain the charting concepts that could be adapted at the detail level.

3. Increase Independent Schedule Assessment Use

The ISA regulation states that this assessment should be done "before each AFSARC/DSARC milestone". This is before the development or production engineeing and related manufacturing effort is committed. The ISA has not been used that often. Newer policy guides have requested it's use before the full scale development decision point. It is recommended that ISA be used prior to every major program decision point, if the schedule integrity is in doubt or very critical. The B-1 program control office indicated that it was helpful in their evaluation, even though it's findings were more pessimistic than they felt it should be. Even taking a "devil's advocate" role the assessment could bring to light several areas that would have otherwise been overlooked.

4. Emphasize Memorandum of Agreement (MOA) Support

This document is the functional tie between the AFPRO and the Program Office at ASD. It is the function of the AFPRO to be the link between the SPO and the work at the contractor's facility. As was previously discussed, the B-1 program control office has also found this to be a very valuable tool in assuring that the right kind of maximum participation and responsibility is delegated to this working level.

It is suggested that ASD Program Office guides emphasize the kind of detail that is needed in the MOAs so as to achieve certain program objectives in regard to planning and scheduling communications with the contractors.

5. Maximize the use of Automated Management Systems

Automated Systems offer the following advantages:

1) Automated systems can minimize repetitive data handling, assure disciplined handling (assuming adequate error identification routines in programs), and maximize sorting capabilities for easier problem analysis.

2) Provide compact data storage capability for historical trend analysis and prediction.

3) Offer multi-program merging and analysis capability along with integration of Vanguard-type systems.

4) Offer data-link potential with contractor for easier and more accurate transmittal of data on a timely basis.

5) Offer options for various planning, scheduling, and related program control systems.

6) Current state-of-the-art systems offer automated visual displays to simplify paperwork and real time availability of information to managers, which is presorted and charted for quick analysis.

Computer applications do present extra handling and work planning problems, but these additional requirements do not outweigh the overall benefits if the system is planned and executed properly. With emphasis is faster production and tighter cost control, automation is a must. Future AFPRO MOAs must require a hard line data link for visualized computer information, reflecting the latest production status in the factory. This kind of a picture is worth many words over a telephone or on printed documents, which often take much time to produce and distribute.

The AMS office in ASD/ACP is obtaining the very best skills available in handling computerized communications, and all of the ASD planning and program organizations must take advantage of this expertise in order to assure the maximum performance which is necessary in the current environment.

6. An ASD Planning and Scheduling Regulation or Guide

This has already been mentioned in the proposed Planning and Scheduling Coordination Office, but a further explanation is important. The heart of this report is that the essential elements of a good planning and scheduling operation are already being put in place at ASD. USAF policy already requires good planning and scheduling. Inadvertant loopholes have caused this function to be neglected. A regulation is needed to close those loopholes with specific coordination requirements. Some of the specific items in this proposed regulation would be:

1) Standardization of selected categories of data, coding and format options, MOA content options, minimum requirements for different size programs, and minimum coordination requirements between the major organizations involved in planning and scheduling.

2) Data handling requirements, especially the retention of historical data for use in Independent Schedule Assessments and other historical analysis, perhaps in the AMIS program.

3) Assurance of organizational rules for this function, and the personnel qualifications required or desired for these types of functional positions.

The role of the Planning and Scheduling Coordination Office should also be covered by this regulation and additional guidelines issued to offer optional systems, along with methods of organizing and manning a planning and scheduling operation.

7. Program Command Visibility Centers

It is a long standing principle that top management interest in program problems and status always generates more interest all the way down the organization. This includes problem resolution and meeting schedule commitments. Some new developments encourage the utilization of a regular command briefing program of a certain type. The computer automation and

communication capability has increased significantly. Program managers can now use visual presentations, at a reasonable cost, in clear charts and graphs that can report program status direct from a contractors facility on the status day. Waiting is no longer required for the handling of large computer paper runs, analysis of the runs, and the printing and distribution of reports to distant places.

The B-1 program is now holding weekly briefings by telecon and is planning for such a stand-up briefing with applicable charts in the near future. The details are not yet worked out, but the commitment to direct-line computer communications with on-screen status visibility has been made.

It is recommended that all program organizations implement a version of what could be called a "Command Visibility Center". The operational principles of such a center would be:

a. The command briefings would be held no longer than two weeks apart.

b. Each area of responsibility is briefed by a senior manager with direct responsibility for that area.

c. The use of direct-line computer communication technology should be used to the maximum extent in chart or graphics presentation, so that the information is recent.

d. Only critical path or "show stopper" items be discussed and only to the degree that problem resolution has not yet occurred.

e. Problem resolution direction should be given by the Commander in the meeting for earliest possible follow-up and action.

f. A formal agenda be followed that addresses past action directives and current problems. Any detailed discussion be done at at follow-on meeting of involved persons.

These types of visibility centers are really an essential part of planning and scheduling operation for the following reasons:

1. Planning and scheduling deals with work activity which is the result of direction. This direction requires follow-up and often redirection or clarification.

2. Lower level management should handle day-to-day direction problems, but within even a weeks time problems on a large program can occur that do not have easy solutions. Only top level visibility will assure these problems are either quickly resolved, or passed to the appropriate level of decision making.

3. The visual presentation of a problem or schedule concern provides the best possible understanding method for management, and allows him to become better involved in what is happening many levels below him.

4. A regular gathering of responsible managers to discuss "hard" problems in a disciplined manner, expediting the management information distribution and decision making process is essential to a smooth running and on-schedule operation.

Regardless of the name used, the function is an essential tribute of most successful schedule sensitive programs such as the B-1. The same type of operation should be considered on a monthly basis at the ASD Command level, dealing in-depth only with those areas requiring that level of action. Again the computer assisted communication technology will make this kind of operation less time consuming than those requiring the paper processing operation which has been familiar in the past.

OTHER PLANNING AND SCHEDULING CONCERNS

1. Planning and Scheduling in a Fixed Price Environment

In a situation where the government has established a firm specification and has a good control on those requirements which must be incorporated into a weapon system, it may be in the best interest of the government to enter into a fixed price contract for the products to be delivered. Most recently this has become a pattern within the Air Force Systems Command. In

1978 a shift to fixed price awards was made. Of the approximately 2000 contracts managed by AFSC, the fixed price procurement contract percentage has grown from 37% in 1976 to 43% in 1979, and is currently 61% of all AFSC contracts. In the same time period cost plus fixed fee number of contracts has dropped from 46% down to 19%. This change has provided a very different environment for contract management within the USAF Systems Command.

These contract management differences are precipitated by the influence of fixed price contracts on the management responsibility of the government versus those of the contractors. The fundamental premise of fixed price contracting is that the requirements are adequately defined, and that the contractor can be left alone to carry out the job. The contractor is therefore required to assume a greater amount of responsibility for the project and the government agrees to buy the contractors management to assure the achievement of the contract objectives. For this risk/responsibility assignment the contractor receives a larger percentage profit and expects to be left alone (for the most part) to do the contracted job.

When one considers the implication of this fixed price relationship on the process of schedule planning and control it is evident that the contractor is given a much more independent role in the schedule planning process. For example, unless the contract terms specify otherwise, he may elect to use his company owned and developed scheduling system rather than comply with certain USAF standards. He may elect to prepare few information schedule reports since he will not normally be required by contract to provide customer reporting on the details of his schedule status. Of course contract provisions can modify this external reporting requirement, but the more external visibility provided, the more tendency there will be for the government contract monitors to interject themselves in the day-to-day management decisions of the fixed price contractors tasks. The normal pattern of the contractor is for him to be left alone to do the contracted job, or for the government to give him a change order for any directions they may elect to impose on the contractor. A much more restrictive relationship will result between government and contractor in this kind of environment. Information that is obtained may be expensive and even biased by these circumstances.

The advantages of fixed-price contracting needs to be weighed against the disadvantages of limited reporting during the life of the contract.

2. Planning and Scheduling Personnel

Since there is no career field that specifically prepares personnel for this function and since the function can demand excellent salary benefits in the commercial market, it is hard to acquire or keep experienced personnel. There are some related fields, such as Industrial Engineering and Program Analyst career field, from which these kinds of people could be drawn. Experience in the organization will prepare the right kind of persons for this function. Some effort needs to be made to identify and track these people as they are developed, and give them career progression in that field along with some financial incentives to stay within ASD. The Program Control office of the Comptroller offers a place for identifying and providing some career administration services, utilizing their matrix organization responsibilities. However, ASD also needs personnel assigned to the comptroller who understand the unique qualifications required for the planning and scheduling function. Some of these qualifications are:

1. The inclination and capability to research and identify context and relationships of specific items. This type of person is more a conceptual than a detail thinker, although detail is important.

2. The capability to think in logical patterns, and carry a task or consequence to its ultimate conclusion.

3. The capacity to mix well with different types of persons in order to obtain necessary information, without becoming discouraged easily, and then clearly redefine the information in planning and scheduling language.

There are, of course, many other characteristics which could also apply to other career fields, but these are the ones that tend to stand out as especially important for this kind of function.

3. System Progam Managers Prerogatives

Planning and scheduling is a part of the management function and, as such, is an extention of the manager's prerogatives. The effort to create an effective planning and scheduling function often does not fit well into the manager's concept of how to control the time, sequencing, and planning functions of the program for which he is responsible. Different planning and scheduling situations require different planning and scheduling approaches. An effort should be made to provide the program manager with as many of these approaches or options as possible. An effort should also be made to educate potential managers on planning and scheduling techniques. Seminars on this subject are available and have changed the thinking of many managers.

There are also some types of planning and scheduling controls that are essential for command understanding of where the program is and what problems could prevent its timely completion.

4. Accelerated Acquisition Possibilities

The AFSC Commander has initiated a study to determine if there was any real potential in accelerating the acquisition process. The results of this study were not available at the time of this report, however, from the planning and scheduling point of view, several factors could be considered:

1. The maximization of an early design freeze, using state of the art basic systems, and a tight configuration control program.

2. A program control system whose planning and scheduling operation consisted of the following elements:

a. A schedule based and controlled by activity logic diagram methods (CPM, etc.), detailed to the supervisory level, backed up with complete internal disciplines, staffed with realistic and experienced scheduling personnel at the contractors level, operated by computer systems with automated display input and read-out capability, and monitored by experienced planning and scheduling USAF personnel at the AFPRO and in the ASD SPO.

b. A high level Command program visibility center in the SPO office, which is worked weekly from the direct line status automated displays and responsible manager briefings, with in-meeting direction and follow-up required for problem areas.

c. An ASD level Command visibility room where the same type briefings take place monthly on all programs, emphasizing only critical milestones and problem areas. Consideration of the user of a modified Vanguard approach in active program evaluation, using the direct automated displays read-out capability of program status.

d. The implementation of the recommended ASD Planning and Scheduling Coordination Office to assure the full and effective implementation of these recommendations.

3. The use of a modified fixed-price contract that will allow the above planning and scheduling visibility, but very limited involvement in the day-to-day operation of a contractor so covered.

4. The maximization of the "Tailoring and Flexibility" paragraph of the Department of Defense Directive 5000.1, dated 29 March 1982.

5. The assignment of program managers who have an optimistic and realistic outlook concerning what can be done in acquisition acceleration, and maintenance of an office that is regularly collecting, reviewing, and recommending new steps that can be taken for such acceleration.

CONCLUSION

With the apparent full acceptance of Vanguard as the overall AFSC planning concept and the initial implementation of the AMS in various programs, particularly the B-1 program, there should now be greater use of the AFPRO MOA, use of the ISA, and the increased concern for careful planning and control. Planning and scheduling activity is having significant break-through at ASD. However, a few key actions are still essential to pull it together and keep it effective. One action is the preparation of the guide now being prepared on planning and scheduling by ACBM. The other action is the establishment of a planning and Scheduling Coordination Office. A detailed review of this report by the ASD staff members of XRX, ACP, ACBM, and other selected organizations who are currently involved in the functions described in this report, would provide ASD Command some inside recommendations of real benefit to our Divisions mission accomplishment.

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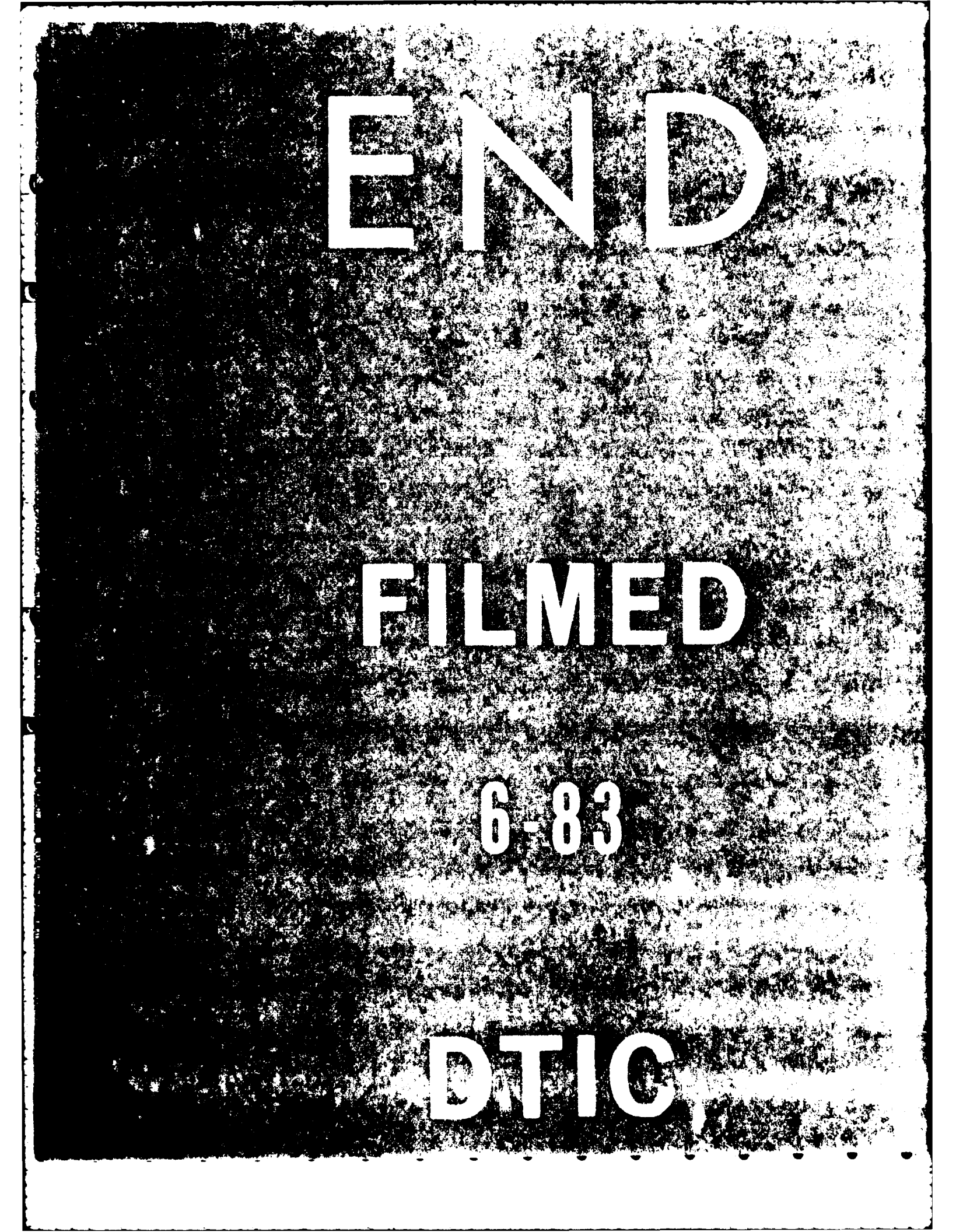
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